June 2009

Y692VB Series Vacuum Breaker



W7429

Figure 1. *Type Y692VB Vacuum Breaker*

Introduction

The Y692VB Series direct-operated vacuum breakers are used for the precise control of small capacity and low-pressure service applications where an increase in vacuum must be limited. The Type Y692VB has internal pressure registration. The Type Y692VBM has a control line connection and an O-ring stem seal to block the throat for external pressure registration.

Features

- **Precision Control of Low-Pressure Settings—** Large diaphragm area provides more accurate control at low-pressure settings.
- **Installation Adaptability—**Four-position vent mounting and 360° adjustability of the union nut connection permit flexibility in vent positioning and installation in awkward positions or limited spaces.
- **Corrosion Resistance—**Constructions are available in a variety of materials for compatibility with corrosive process gases.

D102663X012

Specifications

Body Sizes and End Connection Styles[1]

See Table 1

Maximum Allowable Inlet (Positive) Pressure[2] and Orifice Sizes

3/4-inch (19 mm) Orifice:
30 psig (2,1 bar)

1-3/16-inch (30 mm) Orifice:
13 psig (0,89 bar)

Maximum Casing Pressure[2]

8 psig (0,55 bar) vacuum

Change in Vacuum Control Pressure to Wide-Open[2]

See Table 2

Vacuum Control Pressure Ranges[2]

See Table 2

Capacities

See Table 5

Flow Coefficients

See Table 3

Pressure Registration

Type Y692VB: Internal
Type Y692VBM: External

Spring Case Connection

3/4 NPT

Type Y692VB Gauge Tap Connection

1/4 NPT

Type Y692VBM Control Line Connection

1/2 NPT

Construction Materials

Body: Cast iron, WCC steel (NACE), CF8M Stainless steel (NACE), or Hastelloy® C (optional)

Diaphragm Casing: Cast iron, WCC steel (NACE), CF8M Stainless steel, or Hastelloy® C (optional)

Spring Case: Cast iron, WCC steel, Aluminum, or CF8M Stainless steel

Disk Holder: S30200 Stainless steel **(standard)** or S31600 Stainless steel (NACE)

Disk: Nitrile (NBR) or Fluorocarbon (FKM) **(standard)**, Neoprene (CR), Polytetrafluoroethylene (PTFE), Fluorocarbon (FKM), Perfluoroelastomer (FFKM), or Ethylenepropylene (EPR) NACE

Diaphragm: Nitrile (NBR), Fluorocarbon (FKM), Ethylenepropylene (EPR), or Silicone (VMQ)

Trim: S30200 stainless steel **(standard)**, S31600 Stainless steel (NACE), or Hastelloy® C (optional)

O-rings: Nitrile (NBR), Fluorocarbon (FKM), Perfluoroelastomer (FFKM), or Ethylenepropylene (EPR)

Material Temperature Capabilities[2]

Nitrile (NBR): -40° to 180°F (-40° to 82°C)

Fluorocarbon (FKM):
40° to 300°F (4° to 149°C)

Ethylenepropylene (EPR):
-20° to 200°F (-29° to 93°C)

Perfluoroelastomer (FFKM):
0° to 300°F (-17° to 149°C)

Silicone (VMQ): -40° to 400°F (-40° to 204°C)

Approximate Weights

Cast Iron: 45 pounds (20 kg)

Steel, Stainless Steel, and Hastelloy® C:
57 pounds (26 kg)

1. End connections for other than U.S. standards can usually be provided; consult the local Sales Office.
2. The pressure/temperature limits in this bulletin and any applicable standard or code limitation should not be exceeded.

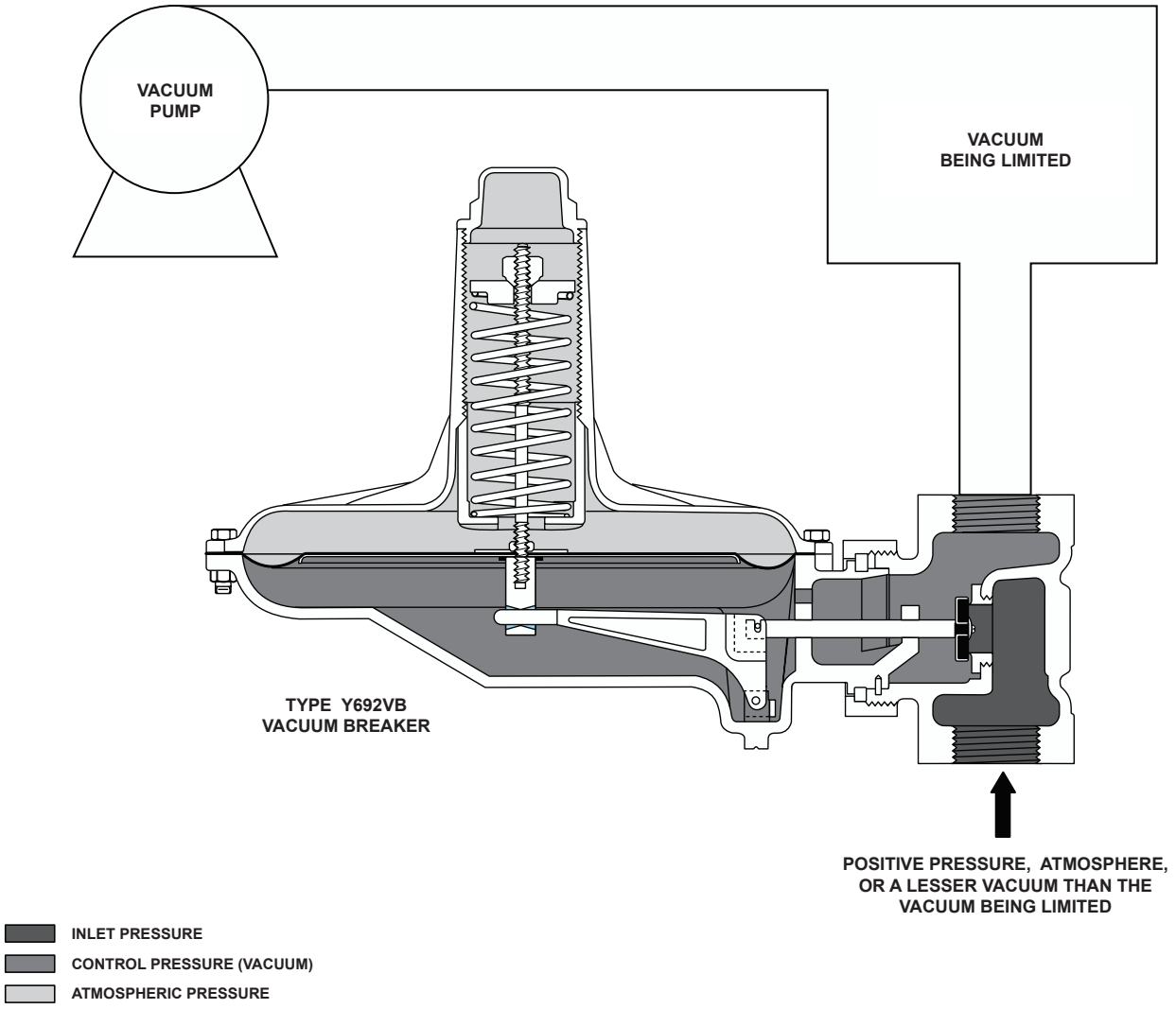


Figure 2. *Type Y692VB Operational Schematic*

Principle of Operation

An increase in vacuum (decrease in absolute pressure) beyond the setpoint registers on the diaphragm, opening the disk. This permits body inlet pressure to enter the system and restore the controlled vacuum to the setpoint. On the Type Y692VB, the pressure at the regulator body outlet registers directly into the diaphragm casing. The Type Y692VBM has a control line connecting the diaphragm casing to the vacuum being controlled and an O-ring stem seal blocking the throat allowing for registration only through the control line connection (outlet body pressure may or may not be the same as the pressure in the diaphragm casing).

Installation

The versatility of the Y692VB Series vacuum breakers permits a wide variety of installations. The body may be mounted in any position (360° rotation possible) relative to the spring and diaphragm cases by loosening the union nut and rotating the diaphragm casing. The spring case can be rotated to fit the orientation required. Any mounting position provides excellent performance. When exposed to the weather, the spring case port should be protected by an optional umbrella vent or should be pointed downward to allow condensate to drain. On indoor installations, this port should be piped outdoors if used in hazardous gas service.

Table 1. *Body Sizes and End Connection Styles*

BODY SIZE, NPS (DN)	CONSTRUCTION MATERIAL AND END CONNECTION STYLE(1)		
	Cast Iron	Steel or Stainless Steel	Hastelloy® C
1-1/2 (40)	NPT	NPT, SWE, CL150 RF, CL300 RF, or PN 16/25/40	NPT or CL150 RF
2 (50)	NPT or CL125 FF		

1. All flanges are welded on to the body and have a face-to-face dimension of 14-inches (356 mm).

Table 2. *Vacuum Control Pressure Ranges and Spring Part Numbers*

VACUUM CONTROL PRESSURE RANGE(1)	CHANGE IN VACUUM CONTROL PRESSURE TO REACH WIDE-OPEN	SPRING PART NUMBER	SPRING COLOR	SPRING WIRE DIAMETER
1 to 3-inches w.c. (2 to 7 mbar)(2)	1.2-inches w.c. (3 mbar)	1D892527022	Brown	0.109-inches (2,77 mm)
1.5 to 5-inches w.c. (4 to 12 mbar)(2)	2.2-inches w.c. (5 mbar)	1D7654000A2	Unpainted	0.120-inches (3,05 mm)
3 to 8-inches w.c. (7 to 20 mbar)(2)	4.0-inches w.c. (10 mbar)	0B0197000A2	Purple	0.148-inches (3,76 mm)
8 to 16-inches w.c. (20 to 40 mbar)	5.0-inches w.c. (13 mbar)	1B766270622	Gray	0.156-inches (3,96 mm)
16 to 32-inches w.c. (40 to 80 mbar)	10.5-inches w.c. (26 mbar)	1B883327022	Unpainted	0.187-inches (4,75 mm)
0.25 to 3 psig (17 to 207 mbar)	2 psig (138 mbar)	1A630627022	Black	0.275-inches (6,99 mm)

1. Pressure ranges are based on the spring case pointing up. Pointing the spring case down increases the pressure range 1.7-inches w.c. (4 mbar). (Example: 1 to 3-inches w.c. (2 to 7 mbar) changes to 2.7 to 4.7-inches w.c. (7 to 12 mbar)).
2. Do not use Fluorocarbon (FKM) with these springs at diaphragm temperatures lower than 40°F (4°C).

Table 3. *Flow Coefficients*

ORIFICE SIZE, INCHES (mm)	WIDE-OPEN C_g	WIDE-OPEN C_v	C_1	K_m
3/4 (19)	260	7.4	35	0.79
1-3/16 (30)	720	20.6	35	

Table 4. *IEC Sizing Coefficients*

X_T	F_D	F_L
0.76	0.50	0.89

Table 5. *Y692VB Series Capacities (based on atmospheric inlet pressure)*

VACUUM CONTROL PRESSURE RANGE	VACUUM CONTROL PRESSURE SETTING	CHANGE IN VACUUM	MAXIMUM ALLOWABLE VACUUM PRESSURE	CAPACITIES IN SCFH (Nm³/h) OF AIR	
				3/4-inch (19 mm) Orifice	1-3/16-inch (30 mm) Orifice
1 to 3-inches w.c. (2 to 7 mbar)	2-inches w.c. (5 mbar)	1-inch w.c. (2 mbar)	8 psig (0,55 bar)	500 (13,4)	1000 (26,8)
1.5 to 5-inches w.c. (4 to 12 mbar)	4-inches w.c. (10 mbar)	1-inch w.c. (2 mbar)		700 (18,8)	1400 (37,5)
3 to 8-inches w.c. (7 to 20 mbar)	7-inches w.c. (17 mbar)	1-inch w.c. (2 mbar)		900 (24,1)	1800 (48,2)
8 to 16-inches w.c. (20 to 40 mbar)	14-inches w.c. (35 mbar)	2-inches w.c. (5 mbar)		900 (24,1)	1800 (48,2)
16 to 32-inches w.c. (40 to 80 mbar)	28-inches w.c. (70 mbar)	6-inches w.c. (15 mbar)		1000 (26,8)	1900 (50,9)
0.25 to 3 psig (17 to 207 mbar)	2 psig (138 mbar)	0.4 psig (28 mbar)		1300 (34,8)	2500 (67,0)

Note

Downstream piping will vary with the installation, but to obtain the calculated characteristics, the pipe should be the same size as the outlet and should be straight for the first 18-inches (460 mm).

Capacity Information

To determine flow capacities for the Y692VB Series vacuum breakers, use the following formula:

$$Q = P_{1abs} C_g \sin\left(\frac{3415}{C_1}\sqrt{\frac{\triangle P}{P_{1abs}}}\right)\text{deg}$$

where,

Q = flow capacity in SCFH (60°F, 14.7 psia) of air
P_{1abs} = absolute inlet pressure, psia (P_1 psig + 14.7)
C_g = flow coefficient (from Table 3)
C_1 = 35 (from Table 3)
$\triangle P$ = pressure drop across the vacuum breaker

If the actual change in control pressure (from the service conditions) is less than the change in control pressure required to reach wide-open (Table 2), the C_g in the formula must be reduced accordingly. To obtain the correct reduced C_g, multiply the C_g (Table 3) by the ratio of the actual change in control pressure to the change in control pressure to reach wide-open.

Conversion Factors

To determine equivalent capacities of 0.6 specific gravity natural gas, propane, butane, or nitrogen, multiply the calculated capacity by the following appropriate conversion factor: 1.29 for 0.6 natural gas, 0.810 for propane, 0.707 for butane, or 1.018 for nitrogen. For gases of other specific gravities, divide by the square root of the appropriate specific gravity.

Ordering Information

When ordering, specify:

Application

1. Composition and specific gravity of gas (including chemical analysis if possible)
2. Temperature range
3. Inlet pressures (maximum, minimum, nominal)
4. Pressure drops
5. Desired pressure setting or range
6. Flow rates (minimum, maximum, normal)
7. Piping size(s)

Construction

Refer to the Specifications section and to each referenced table; specify the desired selection whenever there is a choice to be made. Be sure to specify spring case port location from Figure 4.

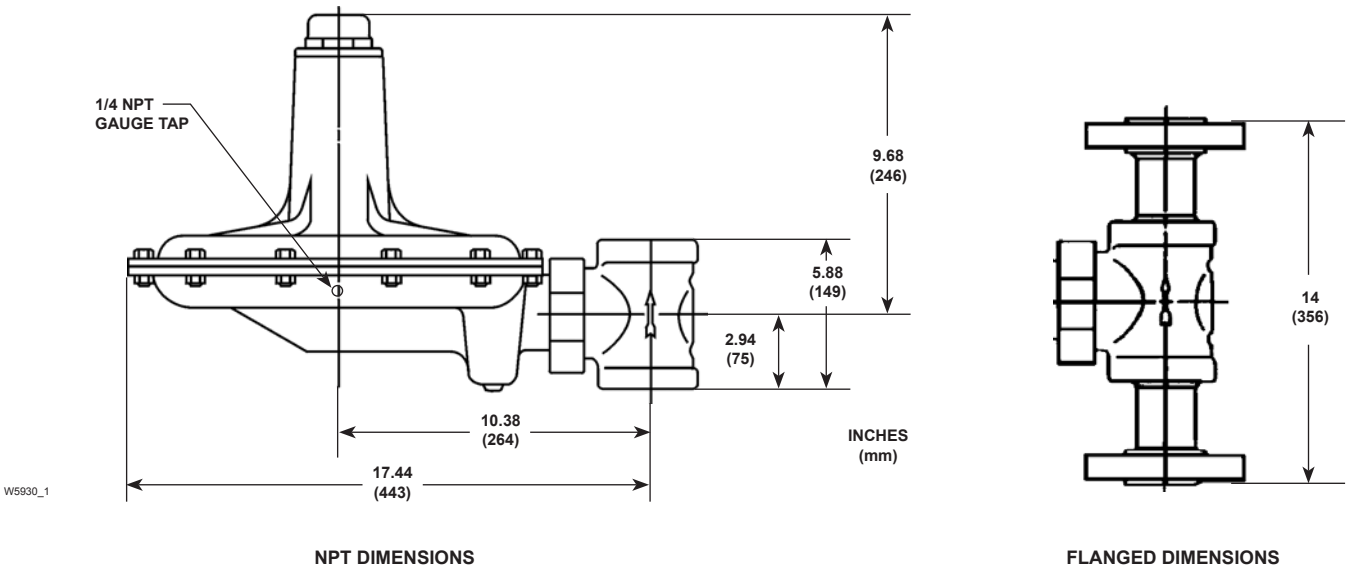


Figure 3. *Y692VB Series Dimensions*

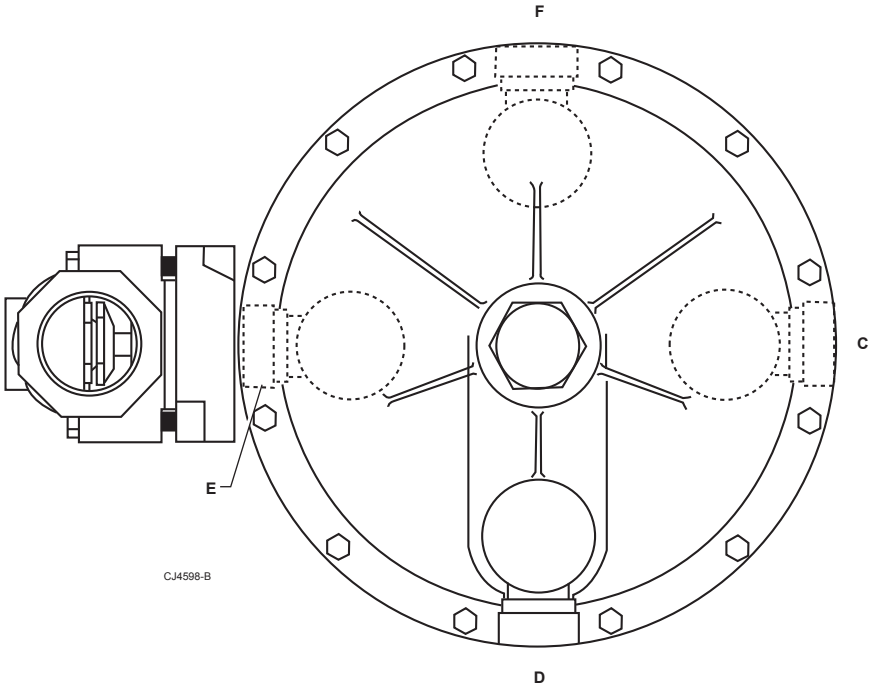


Figure 4. *Spring Case Port Location*

Ordering Guide

Type (Select One)
- ☐ Y692VB (internal registration)***
- ☐ Y692VBM (external registration)***

Body Size (Select One)
- ☐ NPS 1-1/2 (DN 40)***
- ☐ NPS 2 (DN 50)***

Body Material and End Connection Style (Select One)

Cast Iron Body
- ☐ NPT***
- ☐ CL125 FF***

Hastelloy® C
- ☐ NPT*
- ☐ CL150 RF***

WCC Steel
- ☐ NPT***
- ☐ CL150 RF**
- ☐ CL300 RF**
- ☐ PN 16/25/40*

CF8M Stainless Steel
- ☐ NPT***
- ☐ CL150 RF**
- ☐ CL300 RF**
- ☐ PN 16/25/40*

Spring Case Material (Select One)
- ☐ Cast Iron***
- ☐ WCC Steel***
- ☐ CF8M Stainless Steel**

Diaphragm Case Material (Select One)
- ☐ Cast Iron***
- ☐ WCC Steel***
- ☐ CF8M Stainless Steel**
- ☐ Hastelloy® C*

Trim Material (Select One)
- ☐ 302 Stainless Steel***
- ☐ 316 Stainless Steel**
- ☐ Hastelloy® C*

Diaphragm Material (Select One)
- ☐ Nitrile (NBR) **(standard)***
- ☐ Fluorocarbon (FKM)**
- ☐ Ethylenepropylene (EPDM)*
- ☐ Silicone (VMQ)*

Disk Material (Select One)
- ☐ Nitrile (NBR) **(standard)***
- ☐ Fluorocarbon (FKM)**
- ☐ Perfluoroelastomer (FFKM)*
- ☐ PTFE*
- ☐ Ethylenepropylene (EPDM)*
- ☐ Neoprene (CR)*

Orifice Size (Select One)
- ☐ 3/4-inch (19 mm)***
- ☐ 1-3/16-inch (30 mm) **(standard)***

Vacuum Control Pressure Range (Select One)
- ☐ 1 to 3-inches w.c. (2 to 7 mbar)***
- ☐ 1.5 to 5-inches w.c. (4 to 12 mbar)***
- ☐ 3 to 8-inches w.c. (7 to 20 mbar)***
- ☐ 8 to 16-inches w.c. (20 to 40 mbar)***
- ☐ 16 to 32-inches w.c. (40 to 80 mbar)***
- ☐ 0.25 to 3 psig (17 to 207 mbar)***

Replacement Parts Kit (Optional)
- ☐ Yes, send one replacement parts kit to match this order.

Regulators Quick Order Guide	
* * *	Readily Available for Shipment
* *	Allow Additional Time for Shipment
*	Special Order, Constructed from Non-Stocked Parts. Consult Your local Sales Office for Availability.
Availability of the product being ordered is determined by the component with the longest shipping time for the requested construction.	

Vacuum Specification Worksheet

Application Specifications:

Tank Size _____

Pump In Rate _____

Pump Out Rate _____

Blanketing Gas (Type and Specific Gravity) _____

Pressure Requirements:

Upstream Pressure _____

Downstream Pressure _____

Control Pressure:

☐ Upstream ☐ Downstream

Maximum Flow _____

Special Material Requirements:

☐ Iron ☐ Steel ☐ Stainless Steel ☐ Hastelloy® C

☐ Other _____

Other Requirements:

_____

_____

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Emerson Process Management
Regulator Technologies, Inc.

USA - Headquarters
McKinney, Texas 75069-1872 USA
Tel: 1-800-558-5853
Outside U.S. 1-972-548-3574

Asia-Pacific
Shanghai, China 201206
Tel: +86 21 2892 9000

Europe
Bologna, Italy 40013
Tel: +39 051 4190611

Middle East and Africa
Dubai, United Arab Emirates
Tel: +971 4811 8100

Natural Gas Technologies

Emerson Process Management
Regulator Technologies, Inc.

USA - Headquarters
McKinney, Texas 75069-1872 USA
Tel: 1-800-558-5853
Outside U.S. 1-972-548-3574

Asia-Pacific
Singapore, Singapore 128461
Tel: +65 6777 8211

Europe
Bologna, Italy 40013
Tel: +39 051 4190611
Gallardon, France 28320
Tel: +33 (0)2 37 33 47 00

TESCOM

Emerson Process Management
Tescom Corporation

USA - Headquarters
Elk River, Minnesota 55330-2445 USA
Tel: 1-763-241-3238

Europe
Selmsdorf, Germany 23923
Tel: +49 (0) 38823 31 0

For further information visit www.emersonprocess.com/regulators

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